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ABSTRACT -- KEY POINTS

BRDF/Albedo Product

A comprehensive sensitivity and accuracy study was performed for BRDF and albedo retrieval in the period. Expected product accuracies were determined as a function of latitude, time of the year, and land cover type for simulated MODIS and MISR combined angular sampling. Median relative accuracies were about 5 percent in the angular ranges sampled, and 10 to 15 percent in extrapolation to solar zenith angles where the sensors will not make observations. Version 1 software coding goals were negotiated with SDST in a joint meeting in February, a BRDF/albedo validation plan was written as part of the joint MODLAND validation plan, and a suite of radiometric measurements were defined for cross-instrument radiometric validation needs during the EOS test site meeting in March. A paper outlining all aspects of the MODIS BRDF/Albedo Product was submitted to the Journal of Geophysical Research. A programmer was hired for version 1 programming work.

Land Cover/Land Cover Change Product

We continued development and delivered the draft validation plan. Coding for the Beta-3 delivery was a major initiative for this quarter. The MODLAND V1 metadata dictionary was delivered. Algorithm development and testing for the land cover and land cover change products continued.

TASK PROGRESS

BRDF/Albedo Product

BRDF/Albedo Product Sensitivity Study

Sensitivity of the BRDF/Albedo Product to noisy inputs was extensively studied during a stay of associate team member Philip Lewis from University College London at Boston University. Mathematical techniques were found to analyze this sensitivity for the Ambrals BRDF model used for the MODIS product and the RPV model used by the MISR team. All studies were carried out using simulated viewing and illumination geometries for the MODIS and MISR sensors so that sampling effects could be studied. Results are given as a function of latitude, time of the year and land cover type.

Results for both models were very similar. The conclusion was that the models slated for use in operational production are stable with respect to noise both for BRDF and albedo, not only at the solar zenith angle where observations were made but at other angles as well.

BRDF/Albedo Product Accuracy Study

The influence of MODIS/MISR angular sampling characteristics on BRDF and albedo retrieval was studied and expected product accuracies were derived. BRDFs for six different land cover types were forward-modelled using Myneni's three-dimensional discrete ordinates code, then sampled using simulated MODIS/MISR viewing and illumination geometries as a function of latitude and time of year. After inversion of the Ambrals and the RPV BRDF models, retrieved and true reflectances were compared as well as black-sky and white-sky albedos. The median expected product accuracies, when combined with the errors expected from the noise sensitivity study, were found to be of the order of 5 percent at the solar zenith angle of the observations, and 10 to 15 percent at other solar zenith angles.

BRDF/Albedo Product Validation

An extensive BRDF/Albedo validation plan was written as part of the MODLAND joint validation plan. BRDF model validation was distinguished from general pre- and post-launch product validation. The latter will entail continuous measurements at a suite of tower sites, to be established jointly with other MODIS product teams and other instrument teams, and a few selected aircraft campaigns over these sites to allow scaling. During the EOS test site meeting in late March a list of minimum and augmentation instruments was developed defining a tower site for radiometric validation.

BRDF/Albedo Product Version 1 Software

There were no late problems with the beta-3 software delivered to SDST in the fall of 1995. In preparation for the version 1 software delivery due in the summer of 1996 a meeting was held in February between SDST and MODLAND where priorities and schedules were negotiated. This led to a plan for the sequence of deliveries from MODLAND for an integrated version 1. The BRDF/Albedo team hired Jim Tallent as a programmer for the expected increase in critical programming activities throughout the year.

BRDF/Albedo Product Publications

A paper outlining the BRDF/Albedo Product and the Ambrals model validation was written and submitted to the Journal of Geophysical Research. Four papers with direct relationship to the BRDF/Albedo Product were written and submitted to the

proceedings of the IGARSS '96 conference, to be held in May. These concern sampling influences on BRDF retrieval, albedo retrieval, and model validation.

LAND COVER/LAND/COVER CHANGE PRODUCT

During this reporting period, we focused primarily on Beta-3 coding, development of the validation plan and algorithm development for land cover classification. We continued our work with advanced technology (AT) classifiers: neural nets, decision trees and adaptive classifiers.

Test site activity continued in Arizona, Walnut Gulch and BOREAS. We performed preliminary work on the BOREAS study site ATSR and landcover classification data. In work on Walnut Gulch, efforts continued on analysis of the MODIS-like data set to examine feature-selection via decision trees with neural net classifiers.

Research on neural net classifiers continued during this period using the global 1 degree AVHRR NDVI dataset. Decision trees were also examined for potential as a classification tool.

ANTICIPATED ACTIVITIES DURING THE NEXT QUARTER

We will attend an aerosol workshop in D.C., which will allow progress on the BRDF-atmospheric correction coupling problem and contacts to the POLDER surface products team. Spectral-to-broadband albedo conversion methods will be examined. Several talks concerning both products will be given at the IGARSS conference in May and published in the proceedings. A land workshop with a review component will also be held in May. Most notably, however, the version 1 of the software will be produced and delivered.

PROBLEMS/CORRECTIVE ACTIONS

During this reporting period, we did not encounter any significant problems requiring corrective actions beyond the everyday problems that occur in research and algorithm development.